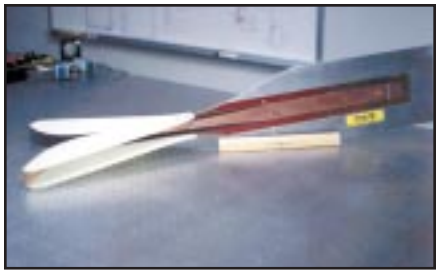
ULTRAFAST SWITCH ENERGIZES DIVERSE MARKETS

An ultrafast optical switching technology finds its way into sensor, medical, manufacturing, electrical utility, and scientific instrumentation markets.



■ The silicon switch (pictured above), developed by Energy Compression Research, can be used in medical, manufacturing, and electrical utility applications.

For more than 30 years, electronic switches have quietly toiled in the fields of electronics, electro-optics, and photonics. Now, optical switches are shaking up the peace.

With the introduction of more sophisticated devices, it generally has become more difficult to perform switching functions electronically. Optically, however, things get easier. Optical switches have faster response times than electronic switches and are less susceptible to electromagnetic interference, making them attractive for a wide range of commercial applications.

Energy Compression Research Corporation (ECR; San Diego, CA) has introduced an optical switching technology, called light-activated silicon switching (LASS), that offers an ultrafast alternative to electronic switches. With picosecond switching speeds and compact packaging, LASS switches have enabled a wide range of high-end commercial products for electronics, electro-optics, and photonics applications. The switches can be used to power lasers, route signals in fiber-optic communications devices, control industrial motors, and power high-frequency radar communications. LASS technology offers high efficiency and cost savings in these areas.

Light switching. LASS technology is based on semiconductor devices that use laser light to switch current on and off. A LASS device uses the absorption of laser light to create the conducting electrons within the semiconductor, resulting in a switching speed that is orders of magnitude faster than conventional electronic switches. ECR developed LASS photoconductive switches with support from Phase I and II BMDO SBIR contracts. These switches were originally designed for BMDO applications in pulsed radar, pulsed power for accelerators, and electromagnetic weaponry.

After the U.S. Department of Defense declassified LASS patents, ECR immediately began an aggressive plan to develop and commercialize LASS technology. On the basis of a market study to identify specific customer needs, which revealed an emerging market for ultrafast optical switches, the company developed LASS-based products and established a manufacturing capability. ECR introduced its first products, the ECR Pockels cell drivers, in January 1995 and completed over $274,000 in product sales during the year. LASS-based technology is now nearing the million dollar mark in total product sales.

With the maturation of LASS, the company has transitioned its business focus from defense to commercial markets. "During our strategic work for the defense industry, we developed a large body of proprietary knowledge on how to 'marry' semiconductors and photoconductive switches to achieve previously unachievable performance in terms of speed and power," says Andrew Palowich, ECR's chief executive officer and president. "Knowing how to manufacture and integrate photoconductors with numerous associated electro-optic devices has enabled us to find much broader commercial markets."

Versatile tools. LASS's high-speed switching capabilities can boost the performance of a wide variety of products and applications, including robotic vision systems that enhance quality control in manufacturing. In addition, LASS-based light detection and ranging equipment can be used for high-accuracy proximity measurements based on reflectance. For instance, this reflectance method is used to measure the distance from the earth to communications and global positioning satellites. For biotechnology tasks, compact microlasers can be incorporated into fluorescence lifetime sensors and flow cytometers, saving space and improving instrument accuracy.

Medical applications abound for ECR's technology. LASS can be incorporated into high-repetition-rate medical lasers, such as those used in refractive eye surgery. It helps provide ultrashort pulse times with low jitter and high accuracy to reduce collateral damage to the eye. LASS also could be used in optical diffuse tomography (ODT), which uses non-ionizing laser light to create anatomical images. Although ODT is still in its infancy, researchers hope it can become a supplement to mammography, much in the way ultrasound fills that role today.

The electrical power industry is keeping its eye on LASS technology, too. In a recent study funded by the Electric Power Research Institute, ECR demonstrated in fault applications the ability to shunt a surge of 10,000 amps in 2 microseconds—five times faster than the thyristors used for this purpose. Currently, ECR is designing LASS surge-suppressing thyristors for high-power electric utility grids. Commercial devices should be available in 1999.

ECR is busy expanding its product line and currently offers Q-switched picosecond microlasers, solid-state laser-diode drivers, and fast Pockels cells. The company sells products and provides research and development services directly throughout the United States, and through eight distributors internationally. Major customers include AT&T, Toshiba, and Boeing.

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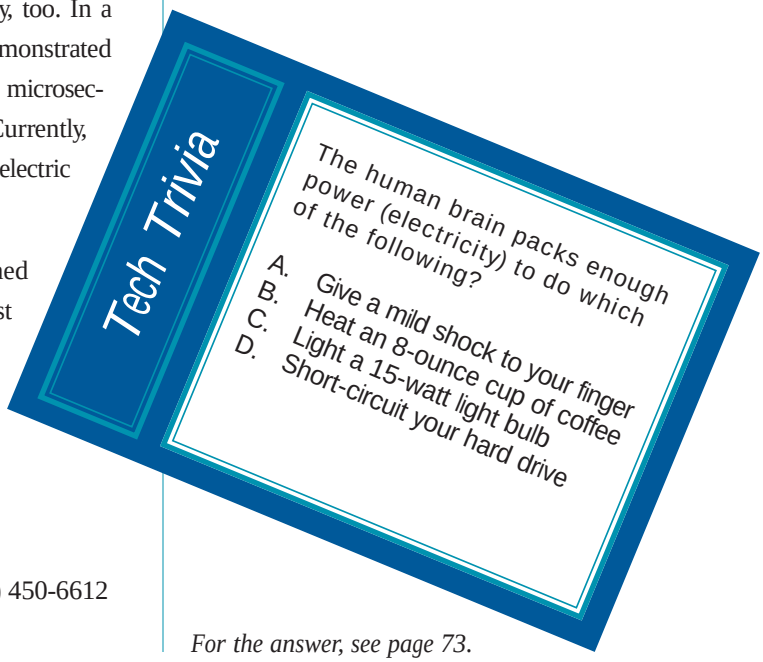
What Does It Mean to You?

Light-activated switches are versatile tools that can be used to increase the accuracy of lasers for eye surgery and boost the performance of industrial vision systems for quality control.

What Does It Mean to Our Nation?

LASS technologies can benefit utilities by helping to ensure reliable power grids to light up U.S. homes and businesses.



For the answer, see page 73.